MOSSES; ILLUSTRATIVE SAMPLES.

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[This article was prepared as a suggestion for the Ohio Schools, and is issued simultaneously as No. 17 of the UNIVERSITY BULLETIN (Series 5.) A wide distribution is advisable and it seems desirable to issue it here also. Ohio teachers, pupils and amateurs will, it is hoped, become more interested in our bryological flora.]

The samples on the accompanying attached sheet are intended to illustrate the kind of material to be collected, and the method of labelling and mounting the specimens, for the Herbarium. It will be noticed that most of the specimens are in "fruit," which is the popular name for the "capsule" that terminates the "se-ta," or slender stem. A delicate cap called the "ca-lyp-tra," may usually be seen, completely or partially covering the capsule before it is fully mature. The terminal portion of the capsule, called lid or "o-per-cu-lum," often drops off when maturity is reached; in this manner the "spores" or microscopical non-sexual reproductive bodies produced within, are allowed to escape. The mouth or opening of the spore case (capsule) is surrounded by a row of slender teeth, called collectively the "per-i-stome;" this may be clearly seen with the aid of a lens after the ripe operculum is removed. The accompanying diagrammatic figures illustrate the parts just mentioned.

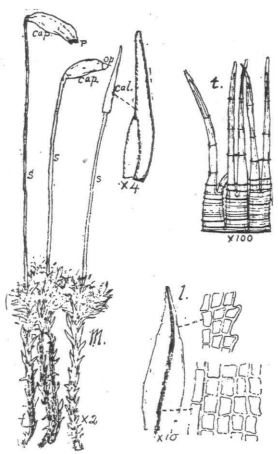

Fig. 1.

The life history, or cycle of development, of our common Mosses may be briefly sketched as follows: When the spores germinate a slender branching tube, or alga-like filament, appears which has been designated the "pro-to-ne-ma." This contains chlorophyll; it grows in moist protected places, and here and there develops root-like threads, called "rhi-zoids," which anchor it to the soil. "Gem-mae" or buds also appear on the protonema and these develop into the upright clustered stems that bear the leaf-like structures. At the apex of the "ac-ro-car-pous" mosses, and from the sides in "pleu-ro-car-pous" species, there are formed the organs for sexual reproduction, namely, "an-ther-id-i-a" and "arche-go-ni-a;" these are surrounded by a cluster of leaf-like bracts, called

FIG. 1.—A common Moss (M) bearing fruit (*s* and *cap.*); one capsule is old, one fresh, one immature and covered by the calyptra (*cal.*); the teeth (*t*) of the peristome (*p*), and a leaf (*l*) magnified, are also shown.

the "per-i-che-ti-um" or perichetial scales. This structure, consisting of the delicate reproductive bodies and their conspicuous and surrounding protecting organs, has been called the "flower" of the mosses.

The microscopic bodies produced in the antheridia (and called "sper-mat-o-zoids"), and that produced in the archegonia (and called the "o-o-sphere"), are designated by the term "gam-etes;" it is their union that constitutes "fertilization." It can now be understood why this stage of the development of the moss plant, as outlined in the preceding paragraph, is designated by the term "gam-e-to-phyte;" it is the plant (or generation) that produces the gametes. It is in popular language the "moss" plant.

The fusion of the two gametes results in the production of the sexual spore, called the "o-o-spore;" it develops at once into the second

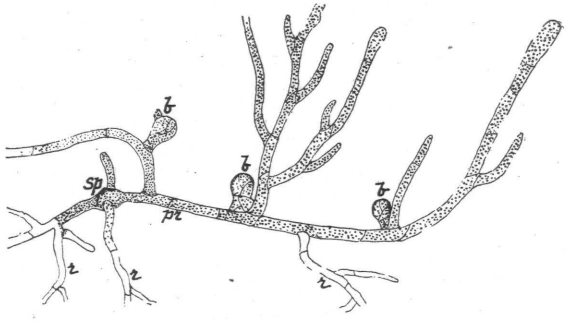

Fig. 2.

generation, or second stage in the life-cycle of the moss plant, which is called the "spo-ro-phyte." It consists of the seta and capsule; the lower end ("foot") of the seta becomes early embedded and fixed in the tissue of the gametophyte, and from it is derived the nourishment necessary to complete the development of the sporophyte, or the plant that produces the numerous non-sexual spores. This "alternation of generations,"—that is, the alternation of gametophyte and sporophyte, —is not peculiar to Mosses, but occurs also in the Pter-id-o-phytes and Sper-mat-o-phytes.

CLASSIFICATION OF THE VEGETABLE KINGDOM.

I. Thal-lo-phytes; as the Slime-moulds, Bacteria, Common Algae (green Pond-scum, etc.), Marine Algae ("Sea-moss"), Moulds, Mildews, Smuts, Rusts, Mushrooms, Toadstools, Puffballs, etc.

II. Bry-o-phytes; The Mosses and Liverworts.

III. Pter-id-o-phytes; The Ferns, Club-mosses and Horsetails.

IV. Sper-mat-o-phytes; The Gymnosperms (Pines, etc.) and Angiosperms (Monocotyls and Dicotyls).

FIG. 2.—The growth or protonema (*pr*,) from the spore (*Sp*.), having rhizoids (*r*), and buds (*b*), from which stems develop.

ORDERS OF MOSSES.

1. Sphag-na-les; the Bog-mosses or Sphagnum.
2. An-dre-æ-a-les; one genus of small Mosses in mountain regions.
3. Ar-chid-i-a-les; only one very short-stemmed species.
4. Bry-a-les; the common Mosses occurring in Ohio.

The only book that could be used by beginners in identifying Mosses, is Grout's "Mosses with a Hand-lens," price $1.10; procure if wanted from the author, or if placed in our hands the order will be attended to. The Manual by Lesquereux and James could be used by advanced students.

It is earnestly requested that contributions of Mosses for the STATE HERBARIUM from every County in Ohio be made. Please send an ample amount of each kind, enclosed in a temporary paper pocket or envelope; with each specimen lay a slip of paper or temporary label, giving *locality, date and collector's name*, also any notes that are made with reference to habitat or habit of the plants. The donor's name and other data will be placed on the permanent label accompanying the herbarium specimens.